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ABSTRACT

A study examined the agricultural technology system in Venezuela with emphasis on the dairy industry. An analytical framework was used to identify the strengths and weaknesses of the following components of Venezuela's agricultural technology system: policy, technology development, technology transfer, and technology use. Selected government documents were revised, and the following individuals were interviewed: 7 national- and state-level policymakers, 22 agricultural researchers, 18 extension agents, and 33 dairy farmers. It was discovered that government expenditures on agriculture averaged 4% of the country's total expenditures during the past 10 years. Accessibility of external sources of technical dairy information to agricultural researchers was found to be low, and three-fourths of the extension personnel interviewed indicated that direct contact between public research and extension personnel occurred either never or only on an ad hoc basis. Although most farmers had knowledge of basic animal husbandry practices, those practices requiring higher input costs, modern equipment, specialized personnel/skills, and/or sophisticated management abilities were adopted less frequently. It was recommended that the government's financial commitment to the agricultural sector be increased and linkages among researchers, extension agents, and farmers be improved. (Contains 29 references.) (MN)

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Summary of Research

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The Dairy Technology System in Venezuela

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Introduction

Strong governmental policies are required for promoting and sustaining agricultural growth. The effectiveness of an agricultural technology system depends upon sound policies that support the agricultural sector. Formulating solid agricultural policies requires input from all parties involved in the system--policy makers, researchers, extension agents, farmers, and agribusinesses (Schuh, 1987). A major concern of many developing countries is increasing agricultural productivity. Although research plays a critical role in generating technologies that raise production levels, research has been criticized for ignoring the production problems faced by small and medium-scale farmers and for neglecting to conduct site-specific, adaptive studies (Kaimowitz, 1991; Roberts, 1987; Cernea, Coulter, & Russell, 1985). One of the functions of extension is to transfer developed technologies and provide feedback from the users to the research subsystem. Extension has been criticized for lacking a clear mission, incurring excessive bureaucratic procedures, and being unresponsive to the problems and concerns of farmers (Rivera, 1991; Axinn, 1988; Baxter, 1987; McDermott, 1987). One of the main purposes of an agricultural technology system is to increase the adoption of improved practices by targeted clientele; adoption levels are affected by many factors, such as input costs, interest rates, and profitability. Users of agricultural technology need to be actively involved in the development and trial of improved practices (Compton, 1989; Pickering, 1985b). Strong linkages must exist among policy makers, researchers, extension agents, and farmers to ensure continued development.

Many research studies neglect to depict the relationships that exist among and within the various components of national agricultural technology systems. Analysis of agricultural technology systems should not be limited to isolated aspects, but rather the system should be examined comprehensively as a functional unit. A systems approach allows for a holistic examination of the interdependent components of an agricultural technology system. Investigating the strengths and weaknesses of a technology system provides a composite portrait of the system and identifies specific areas needing attention (*Agricultural Extension*, 1991; Roling & Engel, 1991; Waugh, Hildebrand, & Andrew, 1989).

Purpose and Objectives

The main purpose of this research study was to describe and analyze the agricultural technology system in Venezuela with an emphasis on the dairy industry. The Analytical Framework developed by INTERPAKS (Peterson, Sands, & Swanson, 1989) was used to guide the research study and to identify the strengths and weaknesses of the Venezuelan agricultural technology system.

The objectives of the study addressed the four components of an agricultural technology system: policy, technology development, technology transfer, and technology utilization. The policy component examines those external factors that directly impact an agricultural technology system, including the utilization of technology by farmers. The objectives for the policy component focused on the government's investment in agriculture, pricing

CE 067 341

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policies for agricultural products, credit availability for farmers, and farmer participation in decision making. The technology development component is the subsystem that is devoted to applied and adaptive research. The objectives for the technology development component focused on access to external sources of knowledge, human resources for agricultural research, research budgets, and allocations to agricultural commodity research. The technology transfer component refers to the transfer activities related to agricultural knowledge and inputs. The objectives for the technology transfer component concentrated on the access to technology from research, human resources for transfer activities, supervision and administration of extension personnel, time and budget allocations for technology transfer, and methods of technology dissemination. The technology utilization component refers to the use of agricultural technologies by farmers, with an emphasis on small holders. The objectives for the technology utilization component focused on the adoption of selected dairy technologies, farmer access to technology, and availability of technology to farmers.

Methodology

The design for the study was descriptive research. This research study examined the linkages among the four major functional components of the Venezuelan agricultural technology system, with particular attention to the strengths and weaknesses of the dairy technology system. A macro-systems model (Swanson & Peterson, 1989) served to organize and guide the data collection process.

Data were gathered from two main sources: government documents and interviews with people representing each of the four major components of an agricultural technology system. To substantiate the information gathered from government documents, selected members of the following agricultural groups were interviewed: a) policy makers (n=7), represented by administrators from the Ministry of Agriculture at the national and state levels, b) researchers (n=22), represented by professional agricultural researchers (Ph.D., M.S., B.S. or equivalent) and research technicians (Diploma and Certificate levels) from the National Institute for Agricultural Research, c) extension agents (n=18), represented by agricultural agents and assistants from the Ministry of Agriculture at the state and local levels, and d) dairy farmers (n=33), represented by small, medium, and large producers and selected members of dairy farmer organizations.

Two sets of instruments were used to collect the research data. The first set of instruments consisted of 25 data gathering sheets designed to collect secondary data from government documents. The published document entitled *A Field Manual for Analyzing Agricultural Technology Development and Transfer Systems* (Swanson & Peterson, 1989) was used to guide the construction of the data gathering sheets. The second set of instruments consisted of three interview schedules developed by the researchers. The primary intent of these interviews was to provide more in-depth information to help understand the linkages among the components of the Venezuelan agricultural technology system. Moreover, interview schedules were designed to go beyond the secondary data by addressing possible suggestions for linkage improvement among the components.

The data gathering sheets were considered valid instruments based on a series of case studies that used the marco-systems model (Peterson, Sands, & Swanson, 1989; Peterson, Zuloaga, Swanson, Uquillas, & Crissman, 1988). The indicators and measures of the systems model have been found to be effective and efficient in describing agricultural technology systems in several countries. A panel of experts established content validity of the interview schedules. Reliability of the data sources was determined by the following methods: a) interview schedules were used to confirm the accuracy of the data gathered through secondary sources, b) multiple interviews were administered to capture a full range of opinions and perspectives of the Venezuelan agricultural technology system, and c) data were examined, whenever feasible, over a 10-year period to display trends.

Research data were collected in three phases: a) administering an introductory survey (n=16) during the Summer of 1991 with the purposes of describing Venezuelan dairy farmers on selected demographic characteristics, determining major problems and issues facing the Venezuelan dairy industry, and assisting in the design of the interview schedules; b) interviewing top-level administrators at the Ministry of Agriculture and the National Institute for Agricultural Research and gathering secondary data from government documents at the national level, and c) interviewing researchers, extension agents, and dairy farmers at the state and local levels. Phases II and III were conducted from November 20 to December 20, 1992.

Descriptive statistics were used to analyze the quantitative data. Percentages, frequencies, ratios, and index and access scores were calculated. Data obtained through the interview schedules were

arranged by patterns and trends that emerged from the responses to the interview questions.

Results

The Agricultural Policy Subsystem

Government expenditures for agriculture in Venezuela averaged 4% during the last 10 years; this percentage is similar to other Latin American countries (Peterson, Sands, & Swanson, 1989). The percentage of the Venezuelan Agricultural Gross Domestic Product (AGDP) invested in agricultural research was 1% or less between 1984 and 1992; extension expenditures were 4% during the same time period. These figures correspond with data from other developing countries (Swanson, Farner, & Bahal, 1990). Retail milk prices in Venezuela have been approximately twice as high as farmgate milk prices for the past six years. The gap between feed concentrate and milk prices is very low. Results of the interviews indicated that 64% of the farmers had credit and all farm-size categories had access to credit; however, the amount of paperwork involved was unreasonable, interest rates were high, and credit was not available in a timely manner. Even though a strong farmer organizational base exists with open membership, decision making, and elections, the organizations are generally controlled by large-scale producers and dairy processors. Farmers interviewed perceived that the organizations are extremely passive and have little influence in formulating dairy policies.

The Agricultural Research Subsystem

Accessibility to external sources of technical dairy information by agricultural researchers is low; contact with external sources of technology is indirect, infrequent, and primarily limited to central-level scientists. The ratio among Ph.D., Master's and Bachelor's degrees for agricultural research in Venezuela is 7:49:44 compared to a desirable ratio of 20:40:40 (Peterson, et al., 1988). The ratio of agricultural technicians to research scientist is 1:1; the recommended ratio of technicians to research scientists is to 2:1 (Peterson, Sands, & Swanson, 1989). Thirteen percent of the public agricultural research budget is allocated to programs which is far below the recommended levels of 35% to 40% (Peterson, Sand, & Swanson, 1989); the remaining 87% of the budget is allotted to salaries and capital investment. Although the livestock subsector accounts for two-thirds of the AGDP, 21% of the research studies focus on the livestock area. Interview data confirmed that the public research agenda is oriented toward export crops rather than domestic crops and livestock, especially dairy.

The Agricultural Extension Subsystem

Three-fourths of the extension personnel interviewed indicated that direct contact between public research and extension personnel never occurred or was on an *ad hoc* basis. Although 47% of extension personnel have a university degree, less than 5% have a Master's or Ph.D. degree. Even though some extension personnel specialize in specific technical areas, the Subject Matter Specialist position does not exist in the Venezuelan public extension subsystem. The majority of the extension personnel interviewed stated that annual evaluations are conducted and the results are distributed, but not discussed. Pay is not awarded on a merit basis and promotions are not based on performance. The time spent on educational activities by the extension personnel interviewed averaged 49%; one-fourth of their time was devoted to non-educational, regulatory activities, while the remaining 25% was allocated for administrative duties. The amount of funding allotted to programs and salaries is extremely inadequate according to the extension personnel interviewed. In addition, extension salaries are far below other institutions in the public and private sectors. The group activities most frequently used by extension agents to transfer technical information to farmers were demonstrations, meetings, and seminars; the average number of demonstrations conducted per extension field agent per year was 12. Flip charts, posters/bill boards, and leaflets/fact sheets were the types of media most frequently used to transfer technical information. The public extension subsystem does not use the radio as a means for transferring technical information.

The Technology Utilization Subsystem

Although the majority of the farmers in the study had knowledge of mastitis prevention, improved forages, feed concentrates, and artificial insemination, those practices that required higher input costs, modern equipment, specialized personnel/skills, and sophisticated management abilities were adopted less frequently. The main reasons for non-adoption of the improved dairy practices were:

high cost, lack of equipment/facilities, lack of information, and low quality inputs. High school/university courses and educational programs conducted by the public extension subsystem were the most frequently mentioned sources for learning about the practices regardless of farm size or the specific dairy practice. The farmers in the study were located an average of 28 kilometers from the nearest agricultural supply outlet, with a range between two and 70 kilometers.

Characteristics of the Venezuelan Dairy Industry

Milk production represented 21% of the total value of Venezuelan agricultural products in 1991 (*Observaciones a la Política*, 1992). Milk production levels decreased by 4.3 % from 1989 to 1992 and the amount of milk available per capita has decreased by 45% over the past six years (Piñate, 1992). Venezuela imported 27% of the total milk consumed in 1991; a projected milk deficit of 1 billion liters is expected by the year 2000 (Piñate, 1992). Eighty percent of the milk processed in 1990 was in the form of powered milk and cheese (*Estadísticas Pecuarias*, 1990). The major dairy breed in the country is a cross between the Zebu and Brown Swiss or Holstein. Feed concentrates are seldom fed to traditional dairy breeds due to the low rate of economic return; dairy cattle are usually fed low quality forages on home-grown pastures. Although large-scale farms represent 11% of the total number of dairy operations, they account for 44% of the total milk production (*V Censo Agrícola*, 1988).

Major Problems Facing the Venezuelan Dairy Industry

Respondents representing policy makers, researchers, extension agents, and dairy farmers were asked to identify the major problems facing the Venezuelan dairy industry. The main problem mentioned was unfavorable governmental policies, such as low milk prices, high input costs, elimination of dairy subsidies, a lack of low-interest agricultural credit, a monopoly in the milk processing industry, a lack of continuity in governmental support for research and extension programs, and a high reliance on imported dairy products. Another area of concern was milk production constraints including, a lack of dairy breeds suitable for the tropics, poor dairy management practices, a lack of high-protein forages, herd health problems, a shortage of dependable labor, and a deficiency in updated dairy technology.

Improving Linkages among Researchers, Extension Agents, and Farmers

Several suggestions for improving the linkages among researchers, extension agents, and farmers were provided by the respondents. The recommendations can be grouped into three areas. The first area encompasses the integration of extension and research activities by collectively establishing short and long-term priorities, developing a joint plan of work to coordinate ideas and programs, establishing regular meetings between research and extension administrators, meeting on a regular basis to discuss research results, assigning extension personnel to research stations to conduct transfer activities, organizing an advisory committee at every research station that includes researchers, extension agents, and farmers, and encouraging interdisciplinary work groups between research and extension personnel. A second area of recommendations centers around the development of the public agricultural research agenda. Suggestions included, conducting research based upon the needs of specific regions, working directly with farmers to assess clientele needs, collectively conducting surveys to diagnose "real" problems to be researched, and creating experimental substations throughout the country. A third area included suggestions offered by farmers for improving the public research/extension subsystems: researchers/extension agents should spend more time in the field and less time in the office, dairy specialists are needed in each state, courses and seminars that focus on regional differences and specific dairy production information should be conducted, research/extension personnel should coordinate their efforts with regional universities, and field trials should be coordinated by research/extension.

Conclusions, Implications, and Recommendations

The Agricultural Policy Subsystem

The Venezuelan government's financial commitment to the agricultural sector is too low to promote growth and sustain development. If funding for the agricultural sector is inadequate and unsteady, then governmental policies will have little impact on production and productivity (*Agricultural Extension: The*, 1990; Baharsjah, 1985; Pickering, 1985a). Increasing and maintaining the percentage of the Venezuelan government's total

budget allocated for agriculture to a minimum of 5% is recommended to attract more people to agriculture and stimulate growth in the sector.

Funding levels, as a percentage of the AGDP, appear to be adequate for developing and disseminating new technologies and improved practices. Adequate funding levels and increased governmental support for research and extension will result in increased agricultural output (Compton, 1989). Maintaining current expenditures for agricultural research and extension is recommended to encourage self-sufficiency and less dependence on imports for the Venezuelan agricultural sector.

Current pricing policies for dairy products favor the dairy processor and discriminate against the producer. When the input/output price ratio is unattractive, the incentive to use new technology and modern inputs is reduced (Schuh, 1987). Increasing the farmgate milk price in relation to the retail price and expanding the feed concentrate to milk price ratio are recommended to attract farmers to the dairy industry and to promote the use of improved inputs.

Although agricultural credit is available, interest rates are high, loan application procedures are excessive, and availability of credit is untimely. When credit policies and procedures do not favor the agricultural sector, many farmers are unable to purchase and use improved inputs (Schuh, 1987). To increase farmer use of agricultural credit, the Venezuelan government should set interest rates that correspond to the profitability of agricultural enterprises. In addition, shortening and simplifying the loan application process is recommended to increase credit use by farmers.

Venezuela has a strong base and structure for farmer organizations as evidenced by the high index ratings and farmer interviews. The needs of small and medium-scale farmers are not likely to be addressed by policy makers, unless farmer organizations represent all levels of producers. Medium and small-scale farmers must become more proactive and united in voicing their problems and concerns through farmer organizations (*Agricultural Extension: The*, 1990; Pickering, 1985b).

The Agricultural Research Subsystem

Public researchers have limited access to direct sources of external dairy technology and information. A lack of direct access to external knowledge and technology delays the technology development process and results in unnecessary research investments for developing countries. To maintain a viable national research subsystem, scientists must network with colleagues throughout the world to keep up to date and to use resources more efficiently (Cernea, Coulter, & Russell, 1985). Increasing direct and frequent contact with the International Agricultural Research Centers (IARCs) and other external research institutions is recommended to ensure continued growth of the Venezuelan public research subsystem. Contact with external sources of technical information should also be made available for researchers at the local experiment stations.

The current number of public researchers with advanced degrees (i.e., Master's and Ph.D.) is extremely low. The educational level of scientific staff and technicians is positively related to the performance of research institutions; a critical mass of qualified scientists is necessary for long-term technology development (Peterson, Sands, & Swanson, 1989). Increasing the number of Ph.D. scientists to the recommended level is suggested for strengthening the public agricultural research capacity in Venezuela.

The monies allocated for public research programs are insufficient to fulfill the goals and objectives of the Venezuelan agricultural research institute. Similarly, monies allotted for salaries are not competitive with comparable institutions. When programming budgets are below the recommended levels, research activity and productivity are severely restricted. A study jointly conducted by the United Nations Development Programme and Food and Agriculture Organization for the United Nations (FAO) reported that the disproportionate allocation between salaries and programming expenses is a major factor contributing to the underutilization and low motivation of research personnel (Peterson, Sands, & Swanson, 1989). Without adequate programming support, research staff are not able to design, implement, and complete scientific investigations. Reducing the portion of the research budget allocated for salaries by "freezing" vacant positions is recommended to increase the monies available for research programming.

The public agricultural research agenda overemphasizes export crops and overlooks the domestic crop and livestock subsectors, especially dairy. The amount of investment in specific commodities should correspond to their contribution to the

AGDP (Swanson & Peterson, 1989). Research programs that emphasize export commodities for foreign exchange establish a high concentration of large-scale, resource-rich farmers, neglect small-scale farmers, and create food shortages (Peterson, Sands, & Swanson, 1989). As stated by the World Bank (cited in Peterson, Sands, & Swanson, 1989), investment in domestic food crop research increases the quality of life in rural and urban areas and creates a surplus for possible exportation. Not only economic factors, but also social and resource-use issues must be considered when setting research priorities (Peterson, Sands, & Swanson, 1989). Reallocating research personnel and programming budgets to the livestock and domestic food crop subsectors is recommended to reduce dependency on foreign food imports.

The Agricultural Extension Subsystem

The linkages between the public agricultural research and extension subsystems in Venezuela are weak, informal, and inconsistent. Without strong linkages between the research and extension subsystems, agricultural development will be hindered (Roling & Engel, 1991; Colle, 1989; Waugh, Hildebrand, & Andrew, 1989; Cernea, Coulter, & Russell, 1985). When research and extension linkages are poor, the prospects of research findings reaching the farmers and accurately assessing farmer needs are unlikely (Baharsjah, 1985; Pickering, 1985a). The realization of the mission and objectives of the research and extension subsystems is hampered when the two institutions work in isolation. Establishing a formal research/extension communication network with strong administrative support is recommended to link the two institutions.

Personnel with Ph.D. or Master's degrees are under-represented in the public extension subsystem. The disparity between the educational levels of researchers and extension agents is not conducive for joint efforts. The lack of personnel with specialized graduate degrees weakens the agricultural technology system, in general, and prevents effective communication between the research and extension subsystems (Rivera, 1991; Axinn, 1988; McDermott, 1987; Pickering, 1985b). Increasing the number of extension personnel with graduate degrees and establishing a Subject Matter Specialist position within the extension subsystem is recommended to improve the human resource capacity of extension and research-extension linkages.

The appraisal and compensation systems of the Venezuelan extension subsystem do not encourage motivation, job satisfaction, and quality performance among extension personnel. The fulfillment of the goals and objectives of an organization are threatened by the inefficient management of human resources (Peterson, Sands & Swanson, 1989). When evaluation procedures and criteria are established and distributed, but not applied, then employee trust, motivation, and performance are jeopardized (Kaimowitz, 1991). The recruitment and retention of qualified personnel is hindered by weak compensation systems; maintaining an effective organization depends partially upon the presence of positive incentives (Fisher, Schoenfeldt, & Shaw, 1990). Designing an evaluation process that provides opportunities for improving job performance is recommended to maximize employee potential in the public agricultural extension subsystem in Venezuela. Revising the current compensation system of the extension institution to be based on performance rather than seniority is recommended to improve the recruitment and retention of qualified personnel.

Extension field agents do not devote sufficient time to educational activities that promote the utilization of new technologies and improved practices. When too much time is spent on non-educational activities, the main purpose and objectives of an extension subsystem are not fulfilled (Swanson & Peterson, 1989). In addition, as a consequence of spending too much time in the office, extension field agents lose credibility and are unable to accurately assess farmer needs (Axinn, 1988). Recognizing the importance of the educational function of the extension subsystem is recommended to increase the amount of time devoted to the transfer of new technologies. Streamlining the quantity of paperwork and administrative reporting is also recommended to encourage a more efficient use of the extension agents' time.

Funding levels allocated for public extension programming appear to be insufficient to carry out technology transfer activities in Venezuela; similarly, salaries for extension personnel do not seem to be competitive with personnel from similar institutions. The transfer of improved technologies to farmers may be detained when disproportionate amounts of monies are designated for salaries, programs, and capital expenditures (Rivera, 1991; Wilson, 1991; Peterson, Sands, & Swanson, 1989). When insufficient amounts of funding are assigned for extension programming, field agents lack teaching materials, transportation, equipment, supplies,

and communication devices to effectively perform their responsibilities (Peterson, Sands, & Swanson, 1989; Axinn, 1988). Low salaries and inadequate benefits are related to high employee turnover and low motivation and job satisfaction/performance (Fisher, Schoenfeldt, & Shaw, 1990). Increasing the amount of the budget allocated for extension programming is recommended to ensure the adequate transfer of new technologies and improved practices by extension field agents. Raising the salary levels for field agents to a more competitive base is recommended to recruit and retain qualified personnel.

Extension field agents are reaching a high percentage of the farming population through a variety of group activities. The overall capacity of an extension subsystem to transfer new technologies is enhanced by contacting a majority of the farming population using a variety of dissemination techniques. The more individual and group activities held, the greater the likelihood that farmers will adopt new technologies (Peterson, Sands, & Swanson, 1989). Increasing the number of individual farm visits by extension field staff, especially to small-scale farmers, is recommended to encourage the utilization of new technologies and to accurately assess the problems and concerns of all farmers.

The Technology Utilization Subsystem

The dairy farmers in the study are aware of the major practices for improving milk production: artificial insemination, feed concentrates, improved forages, and mastitis prevention. Although knowledge of an existing practice does not guarantee its usage, awareness is a first step in the adoption process (*Agricultural Extension*, 1991; Rogers, 1983).

The adoption rate is low for recommended dairy practices that require higher financial investment, specialized equipment, and sophisticated management skills. If increased productivity is a high priority for the agricultural sector, then the barriers impeding the adoption of improved technologies need to be removed (Kaimowitz, 1991; Roberts, 1987; Feder, Just, & Zilberman, 1982). Addressing the economic, political, social, institutional, and infrastructural factors preventing the adoption of new practices is recommended to improve productivity and increase farm income.

Agricultural supply outlets are distributed throughout the country and are accessible to the dairy farmers in the study. The close proximity of farm households to supply outlets facilitates the use of new technologies and modern inputs.

General Recommendations

This study attempted to examine in a holistic manner the strengths and weaknesses of the Venezuelan agricultural technology system with an emphasis on the dairy industry. Through the comprehensive analysis of the system as a functional unit, the linkages among policy makers, researchers, extension agents, and farmers were found to be weak or non-existent. Several constraints were identified that are hindering the progress of the agricultural sector in Venezuela. To improve the Venezuelan agricultural technology system, the following recommendations are proposed: a) establishing governmental policies that provide a long-term commitment to the agricultural sector will secure the design, implementation, and completion of research and extension programs; proactive and influential farmer organizations will help to ensure continuity of agricultural programs and services during administrative changes; b) the public research and extension subsystems should consider forming a national committee composed of small, medium, and large-scale farmers and representatives from private and public agricultural agencies/industries to design the national agenda for the agricultural sector; developing short and long-term strategic plans will help to determine the role that the agricultural sector should play in the Venezuelan economy and in the welfare of the population for the 21st century; c) examining the philosophy, mission, goals, and objectives of the public research and extension subsystems will ensure compatibility with the agricultural needs and priorities of the country; identifying the populations that should be served by the public research and extension subsystems and assessing clientele needs will ensure the effective use of human and financial resources and the design of the research and extension agendas; and d) implementing on-farm adaptive research on a trial basis at selected experiment stations will improve the linkages among researchers, extension agents, and farmers and enhance the credibility of public agricultural personnel among farmers. If the weaknesses in the Venezuelan agricultural technology system are not addressed and corrected, then the agricultural sector will remain depressed, noncompetitive, and inefficient.

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SUMMARY OF RESEARCH

A major concern of many developing countries is increasing agricultural productivity. Although research plays a critical role in generating technologies that raise production levels, research has been criticized for ignoring the production problems faced by small and medium-scale farmers and for neglecting to conduct site-specific, adaptive studies. This study examined the linkages among the four major functional components of the Venezuelan agricultural technology system (policy, technology development, technology transfer, and technology utilization), with particular attention to the strengths and weaknesses of the dairy technology system. It should be of interest to individuals contemplating similar work in other countries.

This summary is based on a dissertation by Ruben D. Nieto under the direction of Janet L. Henderson. Ruben D. Nieto was a graduate student in the Department of Agricultural Education at The Ohio State University. He is currently a Leader, Program Development and Evaluation for Ohio State University Extension. Dr. Henderson is an Associate Professor, Department of Agricultural Education, The Ohio State University. Special appreciation is due to Alvin Larke, Jr., Texas A&M University and R. Dale Safrit, The Ohio State University for critical review of the manuscript prior to publication.

Research has been an important function of the Department of Agricultural Education since it was established in 1917. Research conducted by the Department has generally been in the form of graduate theses, staff studies, and funded research. It is the purpose of this series to make useful knowledge from such research available to practitioners in the profession. Individuals desiring additional information on this topic should examine the references cited.

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SR 79 1994